

## Notes and Comments

### Mandibular Ramus Flexure—Indicator of Sexual Dimorphism?

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In a recent *American Journal of Physical Anthropology* paper (99:473–485, 1996) Loth and Henneberg described what they called a new trait to indicate sexual dimorphism, namely a flexure observable in the dorsal surface of the mandibular ramus. In their opinion, this trait equals all other traits so far described in its overall accuracy to distinguish between the sexes. They have found it to occur almost exclusively in adult male mandibles, whereas it is absent in children of both sexes and in adult females.

Our own radiocephalometric studies on living white children and young adults of female sex (Vinkka and Koski, 1975) showed that a flexure between the dorsal surfaces of the ramus and the condylar process is a very common feature indeed. The average angle between the continuation of the ramal tangent and condylar tangent in 40 girls of 6–8 years of age was 15.8 degrees (SD 7.18), and in 40 young ladies (22–28 years of age) 16.5 degrees (SD 6.38). From these figures it is easy to read that a straight ramus-condyle line was an exception in females, young and adult. Perhaps it should be pointed out that the lateral cephalometric projection tends to give smaller readings than direct measurements of the flexures.

Loth and Henneberg seem to draw a very fine line between the flexure they regard as significant and all other possible flexures in the dorsal line of the ramus. Looking at their own illustrations one wonders, though, how easy it is to distinguish between the sites and degrees of different flexures. In their Figures 2 and 4 somewhat different flexure

sites would seem to be more correct than those indicated by the authors.

The authors stress the role of the muscles, especially of those attached to the jaw, in determining the shape of the mandible. Their description of the attachments of the so-called masticatory muscles deviates from those found in commonly used anatomy texts (e.g., Goss, 1961). The masseter attaches to a large area, part of which is clearly above the level of the occlusal level of the molars; the temporalis again reaches all the way down to the alveolar level of the molars along the anterior edge of the ramus. The illusion that the attachments of the masticatory muscles would somehow be related to the flexure site thus does not agree with the factual situation. Moreover, the muscles that attach themselves to the mandible are not the only ones influencing the growth and thus the shape of the mandible, since the whole soft tissue environment and the occluding dentition together with the bony jaw form the functioning entity.

Interesting observations have been made using the medial axis method of analysing the mandible. Bookstein (1981) already noticed that the coronoid and condylar processes leave only a small part of the ramus unaccounted for. We have found that the branch point of the medial axis practically coincides with the mandibular foramen in the human, which could be interpreted to mean that this foramen would be the branch point for the two processes, from the point of view of functional anatomy (Koski and Varrella, unpublished data on 50 skeletal mandibles, plus radiograms of mandibles of 20 young females and 18 children). The foramen, as a rule, is to be found following the occlusal level of the molars. Thus, the idea that a flexure would be located at this level, from which the condylar process begins, is plausible in principle.

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The relation between the ramus and the condylar process appears to depend on the functional environment of the lower jaw. The direction of the condyle proper, as a rule, is approximately perpendicular to the lateral skull base, but in varying functional instances the ramus must be the adapting part between the articulating condyle and the toothbearing body of the jaw. This leads to flexures of different degree and location between the lower ramus and the condylar process. In our experience, the flexures occur in most individuals, be they male or female, young or adult.

It is possible, of course, that there are populational differences in the occurrence of the flexures, both as regards their location and sexual dimorphism, just as there are populational differences regarding the function of the masticatory organ. It is also quite possi-

ble that there are differences between males and females, on the functional basis. However, the value of the specially demarcated flexure advocated by Loth and Henneberg as an indicator of sexual dimorphism appears still in need of confirmation by independent studies in different populations and with due consideration of the very complex functional aspects involved.

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